STATE OF CALIFORNIA
California Environmental Protection Agency
Department of Toxic Substances Control

SELF – TRAINING MANUAL FOR REMOVING MERCURY SWITCHES FROM MAJOR APPLIANCES

A Guide for Appliance Recyclers

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A GUIDE FOR APPLIANCE RECYCLERS

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INTRODUCTION

What is mercury, and why should I care about it?

Mercury is a naturally occurring element that is poisonous and can accumulate in the tissues of animals and people, causing birth defects, nervous disorders, permanent brain damage, and even death through prolonged exposure. Mercury's unique properties include the ability to exist as a liquid at room temperature, and for decades its unique properties have made mercury useful in a variety of consumer electronic devices and products.

About two-thirds of the mercury released to the environment comes from man-made sources, such as spills, emissions from coal-burning plants, or the incineration or land filling of mercury-containing products. Mercury evaporates at room temperature and even more so when heated. After it enters the atmosphere, mercury can precipitate to the ground with rain and snow, which may potentially enter lakes, rivers, and watersheds. Once mercury reaches a waterway, bacteria convert some of it to methyl mercury, which is highly toxic and very persistent. Because mercury tends to accumulate in the tissues of animals, animals that are higher up the food chain, such as predatory fish, usually have the highest concentrations of mercury in their tissues.

People can be exposed to harmful levels of mercury through inhalation or skin contact, but the primary route of exposure for most people today is eating mercury-contaminated fish. The concentration of mercury absorbed from regular consumption of affected fish can impair the nervous system and other organs, especially in a developing fetus and a young child. Dangerously high concentrations of mercury have been detected in water bodies throughout California. You may have heard warnings for people to avoid eating certain species and sizes of fish because they contain mercury.

Methyl Mercury in Sport Fish: Information for Fish Consumers

Methyl mercury is a form of mercury that is found in most freshwater and saltwater fish. In some lakes, rivers, and coastal waters in California, methyl mercury has been found in some types of fish at concentrations that may be harmful to human health. The California Office of Environmental Health Hazard Assessment (OEHHA) has issued health advisories to fishers and their families giving recommendations on how much of the affected fish in these areas can be safely eaten. In these advisories, women of childbearing age and children are encouraged to be especially careful about following the advice because of the greater sensitivity of fetuses and children to methyl mercury. For additional information, visit OEHHA's Web site, *www.oehha.ca.gov/fish/hg/index.html*.

Because of mercury's distinctive ability to reliably conduct electricity under varied temperature and moisture conditions, it has been used in electronic switches or sensors in a variety of major appliances. Scrap metal recyclers who handle discarded appliances represent the last line of defense against this mercury potentially entering

the environment. (Scrap metal recyclers include used appliance dealers, appliance recyclers, and scrap metal recyclers.) If mercury switches are not removed from major appliances, mercury has the potential to be released to the environment when the appliances are shredded and melted to make new steel. Appliance parts that have mercury and are discarded in landfills may potentially release mercury into the environment through the landfill leachate.

Improper management of discarded major appliances that contain mercury switches represents a potential source of mercury release when considering the amount of mercury in each switch and the large number of major appliances that reach the end of their useful lives each year. Most appliance manufacturers are using alternative switches in new products; however, the appliances that already contain mercury will remain in use and in the waste stream for years to come.

What is the purpose of this manual?

This manual will provide general guidance to scrap metal recyclers about how to find, remove, and manage mercury switches from major appliances in compliance with the latest California laws and regulations. If anything in this guide is inconsistent with California's laws and regulations, you are required to follow the current laws and regulations.

BACKGROUND

What is a mercury switch?

A mercury switch is a sealed container that holds elemental mercury and that is used for completing or breaking an electric circuit, like the convenience light in a chest freezer, or for opening and closing a valve, like a flame sensor. Mercury switches are relatively small and come in various shapes, including bullet-shaped capsules and pellets, elongated bulbs and probes, and thin capillary tubes. Mercury switches can be made of steel, plastic, or glass.

What types of mercury switches are contained in major appliances?

Two types of mercury switches may be found in major appliances.

"Tilt," or "positional," switches measure movement. Such a switch is part of the mechanism that turns a light, motor, or pump on or off by creating an electrical connection inside a mercury-filled pellet that usually has a wire attached to each end. The mercury moving within the switch responds to changes in position and will either complete or break an electrical circuit to turn an appliance (or its light) on or off.

A "thermoelectrical," or "safety valve," switch is used in flame sensors in gas-fired appliances. The ability of mercury to expand when heated and contract when cooled is used to regulate gas flow. Mercury is contained in a probe located in the pilot flame. When the pilot flame heats the mercury and causes it to expand, a diaphragm is opened that allows gas to be supplied to the pilot light. If the pilot is not lit, the mercury cools and shrinks, and causes the diaphragm to close and shut off the gas supply.

What are major appliances?

Section 42166 of the California Public Resources Code defines a "major appliance" as "any domestic or commercial device including, but not limited to, a washing machine, clothes dryer, hot water heater, dehumidifier, conventional oven, microwave oven, stove, refrigerator, freezer, air-conditioner, trash compactor, and residential furnace."

Which major appliances may contain mercury switches?

Mercury switches can be found in some chest freezers, washing machines, gas ranges, space heaters, commercial gas water heaters, furnaces and boilers, gas refrigerators, and gas air conditioners. Listed below are other appliances that typically contain mercury switches. Major brand names for these appliances are listed in Appendix A.

Disclaimer: The Department of Toxic Substances Control does not endorse or recommend any product or brand mentioned in this guide.

- **Chest freezers** that have convenience lights in their lids may contain mercury tilt switches.

- **Washing machines** that do not have a plastic tab mechanism in the lid that acts as a switch for power likely contain a mercury switch. Some washing machines built before the 1980s sometimes used mercury switches.

- **Gas ranges, ovens, and stoves** that have continuously burning pilot lights in the broiler section will contain mercury flame sensors. Ovens that have lights that turn on when the door is opened may have mercury tilt switches. Some of the major brand names of gas ranges, ovens and stoves from the 1960s to the present might contain mercury.

- **Electric or gas space heaters** found alone or side-by-side with ovens may contain mercury switches and/or flame sensors.

- **Commercial gas water heaters** that are 100 gallons or larger may contain a mercury thermocouple instead of an electronic flame sensor. Smaller (residential) gas and electric water heaters do not contain mercury.

- **Other residential and commercial appliances**, including furnaces and boilers, gas refrigerators, gas air conditioners, furnaces, dryers, and microwave ovens, may have thermoelectric switches that contain mercury.

Robertshaw and Harper-Wyman are the major manufactures of mercury probes for cooking appliances. White-Rodgers makes devices for furnaces and heaters.

Unfortunately, there is no comprehensive list of all the makes and models of major appliances that contain mercury switches. Appendix A, however, lists some of the major appliances that generally contain mercury switches.

How much mercury is in these major appliances, and where is it located?

The following table summarizes the amount, location, and function of mercury switches in several major appliances.

Mercury-Containing Switches in Major Appliances

Switch Type	*Component*	*Mercury Content*	*Major Appliance*	*Location & Function*
Tilt Switch	Light On/Off	1-1.5 grams (1-2 drops)	Freezer	Convenience light in lid or door or in the interior of product that turns on/off if lid is raised/lowered or door is opened/closed. Models without lights do not contain mercury.
			Refrigerator	
			Range	
	Power Shut-Off	2-2.5 grams (2 drops)	Washing Machine	Beneath lids that do not have a plastic tab mechanism to turn power on/off (for light and/or spin cycle). Space heaters may contain tilt switches to provide emergency shut-off in case the unit is tipped over. Those that use mercury switches have no visible tabs or slots in the lids.
			Dryer	
			Electric Space Heater	
	Silent Switch	>1 gram (>1 drop)	Microwave Oven	Included in the relay-control compartment to open/close an electrical circuit.
			Electric Oven	
Thermo-electrical Applications (Safety Valve Switch)	Thermostat or Accustat	>1 gram (>1 drop)	Gas Range	Glass thermostat that provides temperature control.
			Gas Space Heater	
			Gas Furnace	
			Gas Water Heater	
			Gas Refrigerator/Air Conditioner	
	Flame Sensor	2.5 grams (2 drops)	Gas Range	Residential and commercial products that have a constant pilot light to turn gas on/off. Located at the burner under the broiler in ranges.
			Gas Space Heater	
			Gas Dryer	
			Gas Furnace	
			Gas Water Heater	
			Gas Refrigerator/Air Conditioner	

What are the existing California regulations for major appliances that contain mercury?

Major appliances are not allowed to be disposed of in the regular garbage (municipal solid waste landfill). In 1997, the California Legislature passed Assembly Bill 847, Statutes 1997, chapter 884 (Stats. 1997, ch. 884), which requires that mercury switches be removed from discarded major appliances before they are crushed or shredded for recycling. In 2001, the California Legislature expanded the scope of the Universal Waste Rule by passing the California Mercury Reduction Act of 2001 through Senate Bill 633, (Stats. 2001, ch. 656). (Refer to the fact sheet, "SB 633: California's Mercury Reduction Act of 2001" on the Department of Toxic Substances Control's (DTSC) Web site, www.dtsc.ca.gov/Schools/EA_FS_SB633.pdf.) In March 2003, DTSC adopted the Mercury Waste Classification and Management regulations (MWCM), California Code of Regulations, title 22, section 66273.1 et seq. (Cal. Code Regs., tit. 22, § 66273.1, et seq.).

Under these regulations, mercury switches removed from major appliances are considered hazardous waste, but they may be managed as universal waste, which has simpler and less expensive handling requirements. (Refer to the fact sheet, "Managing Universal Waste in California" on DTSC's Web site, www.dtsc.ca.gov/PublicationsForms/HWM_FS_UWR.pdf.)

What will the new MWCM regulations stipulate?

Beginning February 9, 2006, the new regulations will designate any discarded major appliance as a hazardous waste if it contains mercury switches. It will be considered a listed hazardous waste (California Hazardous Number M002). The new regulations also allow the products to be managed as universal waste. These requirements are further discussed in the section of this manual titled, *"*HANDLING AND RECYCLING MERCURY SWITCHES,*"* and in more detail in the fact sheet, "Managing Universal Waste in California," noted above.

Who is affected by the new regulations?

Scrap metal recyclers who accept discarded major appliances are affected by the new regulations because they are usually the last facilities to handle the appliances before they are crushed and shredded. Scrap metal recyclers are, therefore, required by law, per Public Resources Code, section 42175, to remove switches from any major appliances that require special handling prior to the appliances being crushed for transporting or transferring to a baler or shredder for recycling. Additionally, any facility that currently removes or handles mercury switches is allowed to manage these switches as universal waste.

Does this guide apply only to discarded appliances?

Yes. Mercury switches should only be removed from major appliances that have been discarded. After the mercury switch (es) has been removed, the appliance should be disabled to prevent its future use. Continued use of some major appliances without a properly operating switch or sensor, especially those in gas appliances, creates a safety hazard. Also, of less importance, removing switches often requires damaging the appliances, such as cracking the plastic top of a chest freezer to access the light switch.

REMOVING MERCURY SWITCHES

Mercury switches must be removed before a major appliance is crushed or shredded. Removing convenience lights and other tilt switches from freezers and washing machines is straightforward and takes only a few minutes. Removing mercury switches from gas appliances, however, takes longer (10 to 60 minutes), requires proper training, and can be hazardous, especially when dealing with gas-fired appliances. Accordingly, proper expertise, personal protection and safety controls, and a suitable storage container for the mercury switches should be in place at all times where switch removal is being done.

No one should attempt to remove any mercury switch from any major appliance unless they are qualified, properly trained, and equipped to remove, handle, and manage mercury switches.

When is the best time to remove mercury switches from discarded appliances?

Mercury switches should be removed by the scrap metal recycler as soon as the appliance is received, preferably while removing any chlorofluorocarbons (CFCs) and/or polychlorinated biphenyls (PCBs) or other hazardous materials to comply with all other hazardous waste laws and regulations.

How do I know which makes and models contain mercury switches?

Appendix A summarizes current information available in the public domain regarding appliances that contain mercury. Contact the appliance manufacturer to confirm mercury switch use in a specific product. A magnet can be used to delineate between non-mercury and mercury flame sensors—mercury sensors are magnetic.

How do I remove mercury switches correctly?

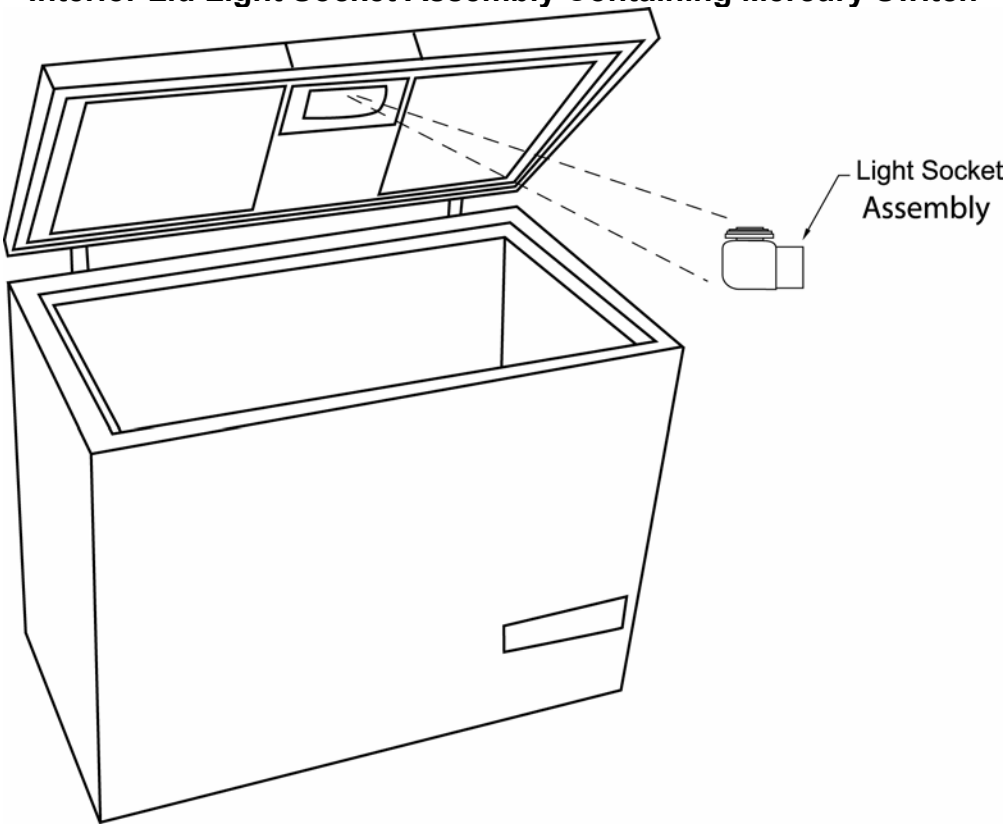
Removal instructions for chest freezers, washing machines, gas ranges, and water heaters are given in this manual. In some cases, these directions may be applied to other appliances; however, specific guidance from the appliance manufacturer should be obtained if you have any uncertainties.

Chest Freezers

Some chest freezers that have an interior lid light contain a mercury switch in the light socket that is designed to turn the light on when the lid is opened. Other chest freezers have a manual light that does not contain mercury, but if the freezer has a light in the cover and no visible push-button mechanism, it probably contains a mercury switch. Upright models and smaller chest freezers do not have mercury switches. The switches are common in both older and newer models; however, **all manufacturers stopped using mercury switches in freezers as of January 1, 2000.**

Switches in newer models are more accessible and can be pried or lifted out, but some older models require removing or cutting away some of the plastic lid liner or insulation surrounding the switch assembly. Switch removal generally takes from one to five minutes, with older models taking longer.

Chest Freezer Diagram Showing Location of Interior Lid Light Socket Assembly Containing Mercury Switch



Seven steps should be followed in removing light switches from chest freezers.

Step 1: Open the freezer lid and look for a manual switch. If there is no light or if you find a manual switch, the appliance can be handled as scrap metal after all other hazardous substances (CFCs, e.g.) have been removed. If there is no manual switch, go to Step 2.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 2: Locate the light socket on the underside of the lid. In some freezers, you may need to remove a plastic light cover and/or plastic insulation cover in the lid.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 3: Remove the light bulb and discard properly.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 4: Remove the hard plastic (black) or boot-type rubber (black or white) housing by unscrewing it or breaking it off. Some housings are marked “Hawkeye.” The mercury will be readily heard inside the device when you shake it by hand.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 5: Gently pull the light socket out of its mounting bracket. Some lights have a glass ampoule switch in line with the light wiring that may be concealed by the insulation in the freezer lid. It may be necessary to cut away some of the plastic or metal on the underside of the lid to locate the switch. **Special care should be taken when removing and handling glass switches.**

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 6: Cut or remove the attached wires.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 7: Remove and properly dispose of the entire light socket as directed in the section of this guide titled, "HANDLING AND RECYCLING MERCURY SWITCHES."

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

The photograph below shows chest freezer light socket assemblies that contain mercury switches.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

The photograph below shows a chest freezer light assembly with an in-line mercury switch.

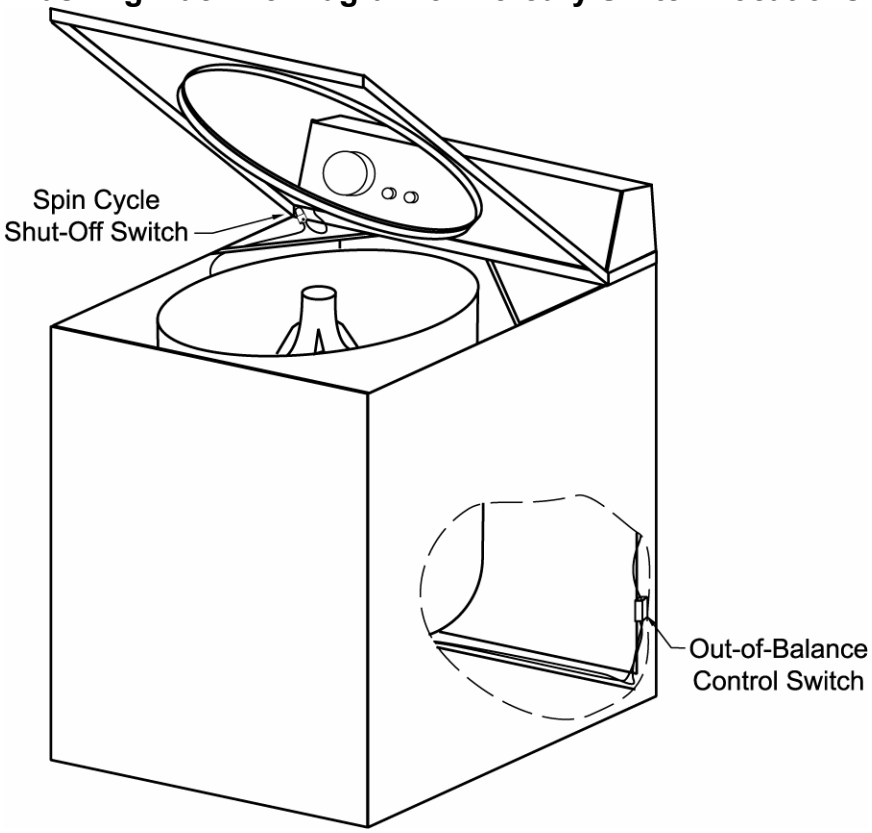
Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Washing Machines

Mercury switches were used in washing machines manufactured before 1980. Switches were used for two applications, both designed to protect consumers. One use was to detect a lid being opened and engage a brake to quickly stop the washer drum from moving. This feature reduces the risk of injury if a person tries to reach into the washer during the spin cycle. The mercury switch, located under the top of certain

washing machine models, was activated when the lid of the washer was opened. Another application was in the dynamic stabilizing system, designed to prevent a severe out-of-balance condition. The switch, located on the back of certain models, was activated if the machine became severely out of balance. Only when you remove the switch can you distinguish between a manual switch and mercury switch in the dynamic stabilizing system. Estimated removal time for these switches is 5 to 10 minutes.

Washing Machine Diagram of Mercury Switch Locations

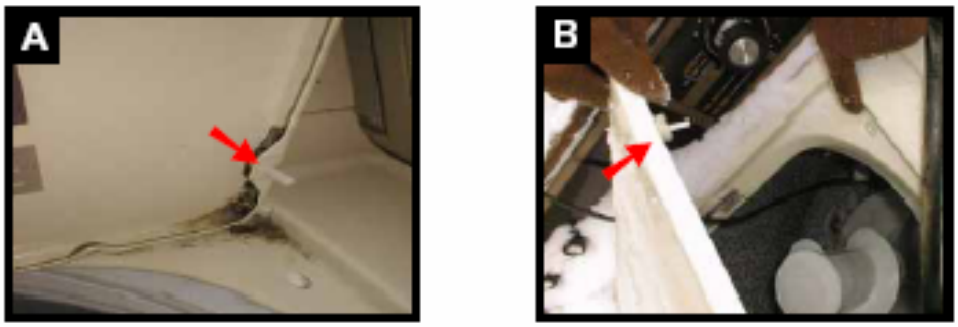


Spin Cycle Shut-Off Switch

Six steps should be followed for removing spin cycle shut-off switches.

Step 1: Open the lid of the washer and examine the rim for a mechanical switch. These switches come in various sizes, shapes, and locations; they may be similar to the “push-button” or “tab” types found in some chest freezers. You should be able to hear an audible “click” when a mechanical switch engages and disengages. If you find a mechanical switch, no mercury switch is present. If there is no mechanical switch, proceed to Step 2.

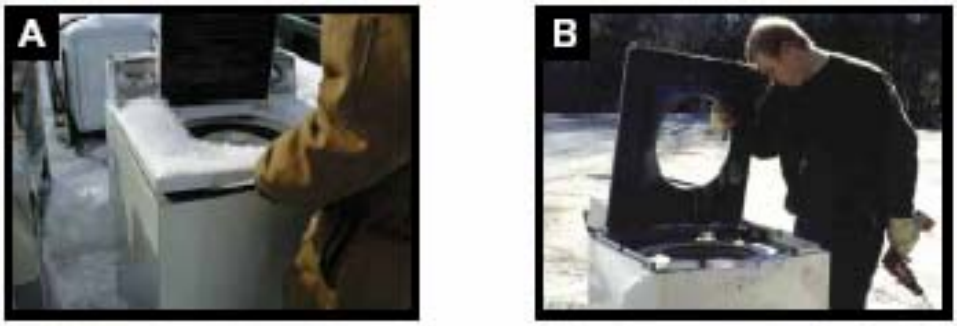
Non-mercury mechanical switch examples:



A) back tab switch B) front tab switch.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 2: Remove the washer top (which will include the lid and top section of the washing machine), cut away any wires, and completely remove this section from the main body of the machine. The washer top usually is held in place with spring clips that can be pried loose or with screws that can be unscrewed or banged loose.



Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

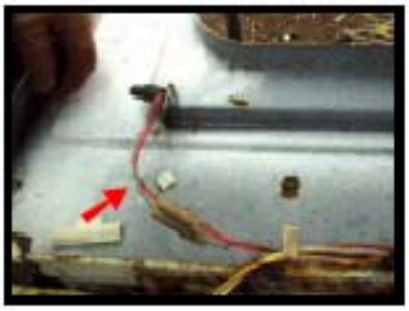
Step 3: On the underside of the washer top, attached to the lid-mounting rod, is the mercury switch. Mercury switches are usually blue or black plastic cylinders about a half-inch in diameter and one and one-half inches long with two wires. Washers may have mercury switches that are glass ampoules of comparable size, in which the mercury is clearly visible.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 4: Remove the switch from the bracket.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 5: Cut or remove any attached wires.



Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 6: Properly manage the switch as directed in the section of this guide titled, "HANDLING AND RECYCLING MERCURY SWITCHES."

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Out-of-Balance Control Switch

Four steps should be followed for removing out-of-balance control switches.

Step 1: Locate the out-of-balance control switch on the back of the machine.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 2: Remove the fastening bolts.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 3: Disconnect the attached wires and examine the attached switch. The mercury switch typically is made of glass, so the mercury inside is visible.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 4: Properly manage the switch in accordance with the section of this guide titled, "HANDLING AND RECYCLING MERCURY SWITCHES."

Gas Ranges

Gas ranges, ovens, and stoves are ignited using either an electronic ignition system or a pilot light. Most pilot-light ranges have a flame sensor, which contains mercury, to shut off the gas supply to the burner when the pilot light is not burning. The mercury flame sensor is attached to the gas burner, which is located beneath the oven cavity in the broiler pan.

The mercury flame sensor is made up of three interconnected parts.

- a safety valve sensor probe ("probe"),
- a safety valve capillary tube ("capillary"), and
- a gas safety valve control ("safety valve").

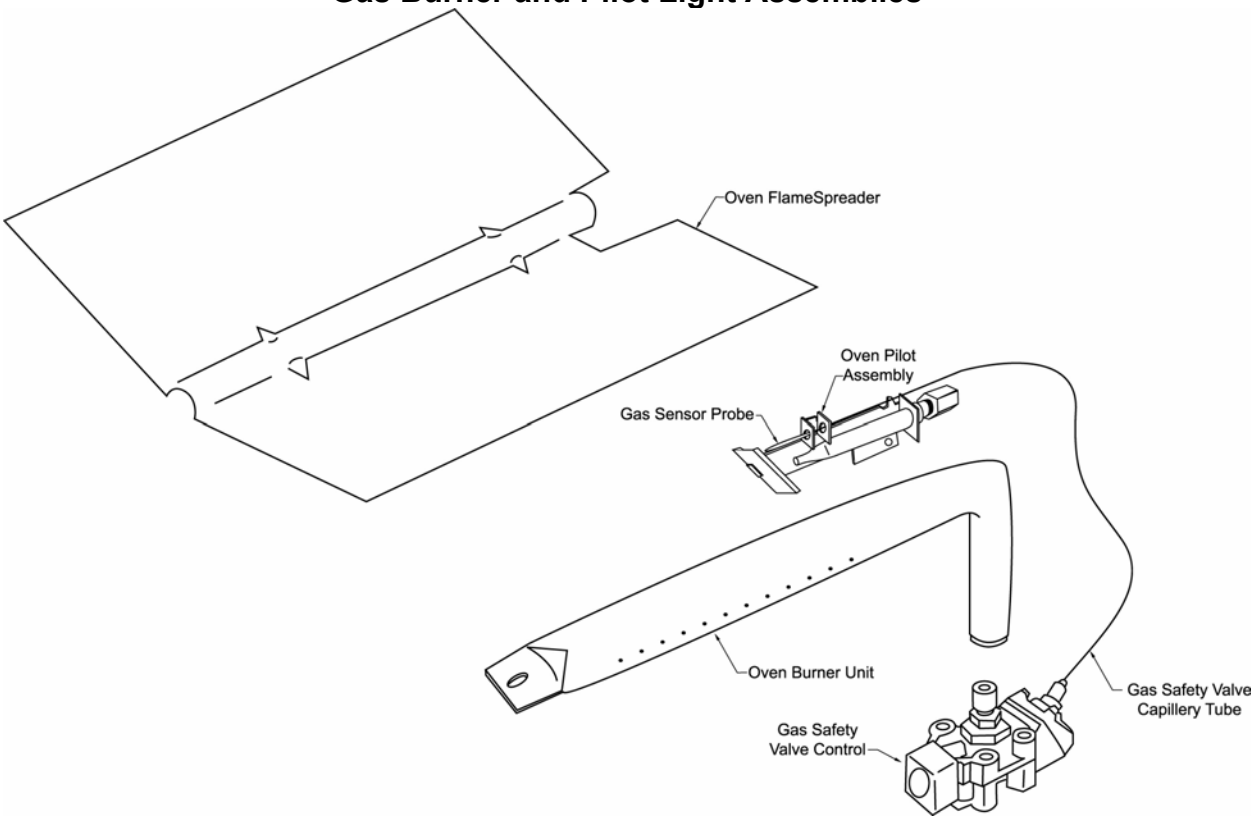
The probe usually protrudes into the pilot-light area. It is connected to the capillary, which is, in turn, connected to the gas safety valve. The safety valve usually is attached to the rear wall of the broiler pan cavity, where it connects to the base of the gas burner assembly. The mercury is contained in the probe and capillary sections of the flame sensor assembly. To prevent mercury leakage, remove all three components of the flame sensor **in one piece**. Estimated time to remove a mercury flame sensor is 10 to 60 minutes.

Gas ranges also have temperature-sensing devices that do not contain mercury. These sensor probes usually are found inside the oven or below the upper burners, where they regulate temperature through wire connections to temperature or oven control knobs. The probes for these devices usually are filled with oil or a sodium/potassium mixture; their capillaries generally are made of non-ferrous metals such as copper. The probes and capillaries of mercury flame sensors, on the other hand, are composed of ferrous metals such as iron or steel. As a general rule, probes made of magnetic metals

usually contain mercury, whereas probes made of non-magnetic metals do not contain mercury. It may be difficult to distinguish between the two, since they typically are covered with baked-on food, grease, and other debris. Using a magnet, therefore, can help determine whether the probe is made of ferrous material.

The following illustration depicts the mercury-containing flame sensor on a gas burner assembly.

Mercury Flame Sensor Assembly Diagram with Gas Burner and Pilot Light Assemblies



Use the following 12 steps to remove safety probes from gas ranges.

Step 1: Place the oven on a protected surface, such as a plastic tarp.

Step 2: Remove the broiler pan drawer at the bottom of the oven to get to the gas burner assembly.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 3: If you find a small ferrous (magnetic) capillary tube near the back wall inside the broiler cavity, the range probably has a mercury flame sensor, and you will need to remove the gas burner assembly, gas safety valve, and all attached gas fittings.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Electronic flame sensors do not have capillary tubes, but instead have two wires that are connected to the gas safety valve. With a gas range that has a bracket covering the flame sensor, simply bend the bracket out of the way to look for the wires. Wires indicate a non-mercury electronic flame sensor. Note that ranges without a mercury flame sensor may be sent for scrap metal processing after making sure there are no fluorescent backlighting or PCBs. If you see a capillary tube in the range, move on to Step 4.

Step 4: Remove the key (sometimes a screw or a pressure-fit tab) that holds the gas burner assembly in place.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 5: Now that the gas burner assembly is loose, disconnect the gas feed line from the gas safety valve by loosening the fitting with a crescent wrench or cutting the gas line. Likewise, disconnect the gas safety valve from the gas burner assembly.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 6: Disconnect the gas feed line from the pilot light assembly by loosening or cutting it. Sometimes there are two feed lines; if so, both should be disconnected.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 7: Unscrew the gas safety valve from the rear wall of the broiler cavity.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 8: Remove the gas burner assembly and the flame sensor assembly together.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 9: Remove the screw connecting the flame sensor assembly to the pilot light assembly.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 10: Carefully pull the capillary tube and probe out of the bracket.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 11: The entire flame sensor assembly (gas safety valve, capillary tube, and probe) are now ready for proper management as described in the section of this guide titled, "HANDLING AND RECYCLING MERCURY SWITCHES."

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 12: Disable or destroy the gas range to prevent anyone from using it without the critical safety device.

The photographs below show an entire flame sensor assembly, which includes the gas safety valve, capillary tube, and probe.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

NOTE: If there is a convenience light inside the oven of a gas stove, there may be a mercury tilt switch attached to the door hinge inside the oven door. This switch can be removed by disassembling the oven door and locating the mercury capsule. Once the capsule is located and identified, disconnect the lead wires, remove the capsule from its fasteners, and place it into a properly labeled heavy plastic container that has a tight-fitting cover.

Electric and Gas Space Heaters

Some electric space heaters have safety switches that shut off the heater if it is tipped over. Switches may be included in radiant quartz heaters, which are tall and round, have a vertical orientation, and sit on a plastic base. Quartz heaters may have a mercury tilt switch mounted inside the heater. Switch removal takes approximately three to four minutes.

Four steps should be followed for removing tip switches from space heaters.

Step 1: Unscrew the plastic base of the heater.

Step 2: Locate the two power supply wires and trace them to the switch mounted near the thermostat.

Step 3: The metallic disk-shaped switch can be unscrewed and the wires removed. A small piece of black plastic, used as a mounting insulator, is attached to the switch. The switch and plastic piece should be removed in one piece.

Step 4: Properly manage the mercury switch in accordance with the section of this guide titled "HANDLING AND RECYCLING MERCURY SWITCHES."

Commercial gas-fired space heaters found alone or side-by-side with ovens may contain a mercury flame sensor. These flame sensors are removed much like those in gas ranges, but may be more difficult to remove. The cast iron burner used in these heaters must be removed along with the probe, capillary, and gas valve. This assembly must then undergo further dismantling outside of the unit. Removal time may exceed 30 minutes.

Commercial Gas Water Heaters

Commercial gas water heaters, which hold 100 gallons or more, may have a mercury thermocouple instead of an electronic flame sensor. Estimated removal time is 5 to10 minutes.

Four steps should be followed for removing safety probes from water heaters.

Step 1: Locate the temperature control unit.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 2: Determine whether there is an electronic flame sensor, which will be indicated by the presence of insulated wires, or if there is a mercury thermocouple, which can be determined by using a magnet.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 3: Remove the mercury thermocouple assembly by, first removing the bottom of the heater and loosening the nut that is holding the probe in place near the gas burner.

Source: Vermont Agency of Natural Resources, Environmental Assistance Division (www.anr.state.vt.us/dec/ead/mercury/appman.pdf)

Step 4: Manage the mercury thermocouple assembly according to the guidelines described in the section of this guide titled, "HANDLING AND RECYCLING MERCURY SWITCHES."

Other Appliances

Residential and commercial appliances should be examined closely to identify whether they contain a mercury switch. Such appliances as clothes dryers, microwave ovens, refrigerators, air conditioners, and furnaces may contain tilt or thermoelectric switches. The guidance supplied in this guide may be applicable to these other appliances, but it is recommended that you contact the product manufacturer for product-specific guidance.

HANDLING AND RECYCLING MERCURY SWITCHES

Do I need to keep records of the mercury switches I remove from appliances?

Yes, you are required to keep records of the mercury switches removed from appliances for three years. A sample form for keeping track of switches is provided in Appendix B. The way you handle the switches and the records you keep will determine how you may manage them. Although the mercury switches that are removed from appliances are considered hazardous waste, they may be managed as universal waste. Waste management will be discussed further below.

How should removed mercury switches be stored prior to recycling?

There are several things to keep in mind when collecting and storing mercury switches for eventual recycling.

- Place removed switches in a leak-proof container that is in good condition. Use a heavy plastic pail or container that has a tight-fitting lid.
- Do not use tin or aluminum containers; mercury can react with these metals and can also leak through the seams of the containers.

- Pack the removed switches with packing materials, such as bubble wrap, to prevent breakage or leakage during storage, handling, and transportation.
- The container should be labeled with the words, "Universal Waste – Mercury Switches," "Waste Mercury Switches" or "Used Mercury Switches."
- Store the containers in a designated accumulation area of your facility where they are unlikely to be disturbed.
- **Do not dispose of removed switches with non-hazardous waste!**

Are removed mercury switches considered hazardous waste or universal waste?

Once removed, mercury switches may be managed as either **hazardous waste or universal waste**. You should contact your current hazardous waste contractor (those used for hauling CFCs or waste oil, for example) to ask whether they will accept the mercury switches. Alternatively, removed mercury switches may be managed under the simpler and less expensive Universal Waste Regulations that allow certain widely generated wastes to be managed under reduced handling and transport requirements. Allowing mercury switches to be handled as universal waste is intended to encourage increased recycling of switches. A complete description of universal and hazardous waste requirements is provided in Appendices C and D, or you can refer to the fact sheet, "Managing Universal Waste in California" on DTSC's Web site, www.dtsc.ca.gov/PublicationsForms/HWM_FS_UWR.pdf to learn more about how to manage universal waste.

How long can I keep mercury switches at my facility after removing them?

If your facility handles mercury switches as a universal waste, you may keep removed mercury switches in a designated accumulation area at your facility for up to one year. Thereafter, you may send them off site for recycling. If handled as hazardous waste, mercury switches may be kept on site for 90 to 270 days, depending on the total amount of hazardous waste you generate per month. See Appendices C and D for more information.

Is a hazardous waste manifest required for transporting mercury switches?

Transporting mercury switches as a universal waste does not require a hazardous waste manifest if the package of mercury switches does not exceed one pound. (Approximately 450 mercury switches contain one pound of mercury.) For ground shipping, the switches may be carried by a universal waste transporter under a bill of lading. The mercury switches, however, must be securely packaged to prevent breakage during transport. Some carriers may have company-specific packaging protocols to meet these requirements.

If a package contains more than one pound of mercury, it must be transported in compliance with U.S. Department of Transportation (DOT) hazardous materials regulations (HMR), which are found in Title 49 Code of Federal Regulations (CFR) Parts 171 – 180. Even if it contains less than one pound of mercury, a package of mercury switches that is shipped by air or water must comply with HMR.

In many states, discarded mercury switches are not universal wastes and may instead be fully regulated as hazardous wastes. In most or all of these states, mercury switches produced by generators of less than 100 kilograms (220 pounds) of hazardous waste per calendar month are exempt from the uniform hazardous waste manifest requirement. Consequently, these generators' discarded mercury switches are also exempt from DOT's requirements for transporting hazardous wastes. Provided they are not transported by air and are placed in packages that do not exceed one pound of mercury, these generators' switches are also exempt from HMR.

In states where they are not universal waste, discarded mercury switches produced by generators of more than 220 pounds per month of hazardous waste must be shipped with a uniform hazardous waste manifest.

If managed as hazardous waste, however, the mercury switches must be transported by a hazardous waste transporter who has: (a) a valid registration with DTSC, (b) must use the uniform hazardous waste manifest, and (c) must deliver the mercury switches to a permitted hazardous waste facility.

Who will take removed mercury switches?

Mercury switches must ultimately go to an authorized "destination facility" where the mercury is recovered from the switches and recycled. The mercury switches that you collect may be transported directly to a destination facility or to a universal waste handler who consolidates the switches before sending them to a recycler.

Handlers of universal waste mercury switches may use their current hazardous waste hauler to transport the switches, or they may self-transport the switches. Alternatively, mercury switches may be transported by a commercial carrier that accepts universal waste, as long as the mercury switches are handled as such. Such carriers should be contacted first to determine what their policies are for transporting universal waste.

Vendors should be contacted directly to obtain specific guidance about their services and costs. Appendix E lists some of the mercury switch handling and transporting facilities that serve California. Destination facilities that recover and recycle mercury switches and serve California are listed in Appendix F.

Do I need to keep records of mercury switches that I send off site for recycling?

Yes. If mercury switches are handled as universal waste, a record such as a log, invoice, bill of lading, or other shipping document should be kept for at least three years from the time the mercury switches leave the facility. This record should include the

number of mercury switches shipped, date they were shipped, and name and address of the facility to which the mercury switches were shipped. A sample shipping record is provided in Appendix G.

The following records also must be kept on paper or electronically for at least three years:

- the total number of appliances destined for shredding;
- the total number of appliances destined for crushing, baling, shearing, or shredding that were determined to contain one or more mercury switches;
- the number of mercury switches removed from these appliances; and
- the number of appliances from which mercury switches could not be removed due to the damaged condition of the appliance.

MERCURY SAFETY AND SPILL GUIDELINES

General Safety Precautions

Because mercury is harmful if inhaled, ingested, or touched, proper safety precautions must be followed at all times. Further, you must be prepared to deal with spills or leaks of mercury from switches.

Before you begin handling mercury switches, be sure to have a plan in place for responding to a mercury spill. Your plan should include precautions to prevent spills and leaks from occurring and procedures to prevent the exposure of employees to mercury in the event that a spill does occur. The plan should cover:

- appropriate personal protective equipment,
- procedures for cleaning a spill,
- waste management procedures,
- first aid procedures,
- when to summon emergency responders (such as the local fire department's hazardous materials team), and
- proper disposition of mercury and cleanup residues.

Consult with your fire department when developing your plan, and make sure you have the necessary cleanup supplies (spill cleanup kits, containers) and personal protective equipment on hand before you begin handling mercury switches.

NOTE: Before any mercury switch is removed, confirm that there are appropriate personal protective equipment and mercury spill response equipment on site and easily accessible, and that staff are properly trained to manage a potential spill.

Important things to keep in mind when cleaning a mercury spill
(The following information is not a complete description of the procedures for responding to a mercury spill.)

1. **Never use a broom to sweep up mercury. Sweeping creates even smaller beads of mercury, which will be more difficult to collect.**
2. **Never use a vacuum to clean up a mercury spill. Mercury readily becomes a vapor, and a vacuum will disperse mercury into the air where it can be inhaled.**
3. **Never wash contaminated clothing in a washing machine. Place contaminated clothing in double garbage bags, tying the bags individually. Dispose the bags using a permitted hazardous waste handler.**

First Aid Measures

If a mercury spill occurs that exposes anyone to mercury, follow these procedures.

1. *Skin contact*—Wash the area with soap and water. Remove any clothing that has come into contact with the mercury, and seal it inside a plastic bag. Seek medical attention immediately. Properly dispose the sealed bag of contaminated mercury clothing using a hazardous waste handler at the first opportunity.
2. *Eye contact*—Flush eyes with running water for at least 15 minutes then seek medical attention immediately.
3. *Inhalation*—Move the person to an area where he or she can get fresh air. Seek medical attention immediately.
4. *Ingestion*—Seek medical attention immediately.

Contact your local poison control center or health care provider for more information.

FOR MORE INFORMATION

For specific information about mercury and mercury switch management, and information about regulatory requirements, please contact the DTSC office nearest you, or call the regional Public and Business Liaisons at:

- (800) 72TOXIC (1-800-728-6942) or visit www.dtsc.ca.gov
- DTSC Headquarters – (916) 323-2678
  1001 I Street, Sacramento, CA 95814-2828
- Sacramento Office – (916) 255-3617
  8800 Cal Center Drive, Sacramento, CA 95826
- Berkeley Office – (510) 540-3739
  700 Heinz Avenue, 2nd Floor
  Berkeley, CA 94710
- Clovis Office – (559) 297-3901
  1515 Tollhouse Road, Clovis, CA 93611-0522
- Glendale Office – (818) 551-2830
  1011 North Grandview Ave., Glendale, CA 91201-2205
- Cypress Office – (714) 484-5400
  5796 Corporate Ave., Cypress, CA 90630

For general information about mercury and mercury switches, you may also contact:

- U.S. EPA—RCRA, Superfund & EPCRA Call Center at 800-424-9346 or www.epacallcenter@bah.com
- U.S. EPA at www.epa.gov/mercury/
- U.S. EPA-Region 5 at www.epa.gov/region5/air/mercury/mercury.html
- Association of Municipal Recycling Coordinators at www.amrc.guelph.org/
- Appliance Recycling Information Center at www.aham.org/aric/aric.cfm

Disclaimer:
This guide does not replace or supersede statutes and regulations. Always review the most current statutes and regulations. The Department of Toxic Substances Control does not endorse or recommend any product or brand mentioned in this guide.

REFERENCES

Draft Wisconsin Mercury Sourcebook: Automotive. Wisconsin Department of Natural Resources. 2000.

Guide for Identifying Mercury In Household Applications. Burlington Board of Heath. December 27, 2000.

Household Appliance Mercury Switch Removal Manual. Vermont Agency of Natural Resources, Vermont Mercury Reduction & Education Campaign, and Chittenden Solid Waste District. Spring 2002.

Household items that may contain mercury. DRLP Fact Sheet. Ohio Division of Recycling & Litter Prevention.

How to Add Mercury Switch & Sensor Removal to a Municipal White Goods Program – AMRC Manual. Association of Municipal Recycling Coordinators. March 2002.

INFOBulletin #8 – Mercury In Home Appliances. Appliance Recycling Information Center (ARIC). August 1998.

Mercury Containing Products - Fact Sheet #21 (Revised). Environment Canada. Federal Programs Division, Pollution Prevention Program.

Mercury-Containing Products and Alternatives. INFORM, Inc. 2001.

Mercury in Products Database. Northeast Waste Management Officials' Association (NEWMOA), Interstate Mercury Education & Reduction Clearinghouse. Search categories: Appliances, Search date: March 18, 2003.

Mercury in the Environment: The Waste Connection. U.S. Environmental Protection Agency-Region 5. Great Lakes National Program. 2002.

Mercury Switches in Appliances: Final Report. Prepared for Massachusettes Department of Environmental Protection by Franklin County Solid Waste Management District. Available at U.S. Environmental Protection Agency, Region 5 - Air Web site.

Ontario White Goods Collection & Mercury Switch/Sensor Removal Pilot – Final Report. Association of Municipal Recycling Coordinators. Prepared for Environment Canada. March 2002.

Pre-Demolition Environmental Checklist and Guide: Mercury. Minnesota Pollution Control Agency. December 2000.

Purchasing for Pollution Prevention. INFORM, Inc. 2001.

APPENDIX A

MANUFACTURERS/MODELS OF MAJOR APPLIANCES THAT CONTAIN MERCURY SWITCHES

Table 1 – Tilt Switches

Appliance Type	Manufacturer/Brand	Year	Switch Location
Chest Freezers	Amana	Pre-2000	Light socket in lid
	Baycrest		
	Beatty		
	Belwood		
	Bradford		
	Cdn. Appliance Manu.		
	Continental		
	Coronado		
	Deep Freeze		
	Derby/Denby		
	FHH8		
	Franklin		
	Frigidare		
	GE*		
	General Freezer		
	Hotpoint		
	Kelvinator		
	Kenmore		
	McCleary		
	McGraw-Edison		
	Montgomery Ward		
	Norseman		
	RCA		
	Sears Coldspot		
	Simpson Sears		
	Supreme		
	Viking		
	Westinghouse		
	Wood		
	Zenith		
Washing Machines	Kenmore	Pre-1990	Mounted to arm on lid concealed under cover (left side) for spin cycle in 1980s Also dynamic stabilizing system pre-1972
	Maytag		
	RCA Whirlpool		

*New models of these appliances also may contain mercury switches.

Sources: *Guide for Identifying Mercury in Household Applications*. Burlington Board of Heath. December 2000.

Mercury Switches in Appliances: Final Report. Prepared for Massachusetts Department of Environmental Protection by Franklin County Solid Waste Management District.

Ontario White Goods Collection & Mercury Switch/Sensor Removal Pilot – Final Report. Association of Municipal Recycling Coordinators. Prepared for Environment Canada. March 2002.

APPENDIX A
Manufacturers/Models Of Major Appliances That Contain Mercury Switches

Table 2 – Flame Sensor or Safety Valve*

Appliance Type	Manufacturer/Brand	Switch Location
Ranges/Ovens/ Stoves With or Without Electric Connections	Cholson/Colson	Front of broiler
	Coloric	Rear of burner
	GE	Rear of broiler
	Glenwood	Rear of broiler
	Magee	Rear of broiler
	Magic Chef	Broiler burner
	Preway	Burner
	Sears	Rear of broiler
	Whirlpool	Rear of broiler
Gas Ranges w/Space Heater	Coloric	Heater burner
	Magee	
Space Heaters	Presto	Inside bottom
	Thermo Pride	On burner
Commercial Water Heaters	GE	On burner
	Rheem	On burner
Furnaces & Boilers	Thermo Pride	On burner
	White Rodgers	
Gas Refrigerators	All except Norcold 1082, 600, 900, 1200	On burner
Gas Air Conditioners		

*New models of these appliances also may contain mercury switches.

Sources: *Guide for Identifying Mercury in Household Applications*. Burlington Board of Heath. December 2000.
Mercury Switches in Appliances: Final Report. Prepared for Massachusetts Department of Environmental Protection by Franklin County Solid Waste Management District.
Ontario White Goods Collection & Mercury Switch/Sensor Removal Pilot – Final Report. Association of Municipal Recycling Coordinators. Prepared for Environment Canada. March 2002.

Disclaimer: Mention of product names is not to be construed as an endorsement of that product.

APPENDIX B
SAMPLE LOG FOR MERCURY SWITCH REMOVALS

Date	Appliance Type	Appliance Manufacturer & Model	Estimated Age/Date of Manufacture	Switch Location or Appliance Too Damaged to Remove Switch	# of Switches Removed

APPENDIX C: SUMMARY OF UNIVERSAL WASTE HANDLING, TRANSPORTING AND RECYCLING REQUIREMENTS[1]

Waste Management Requirements	Large Quantity Universal Waste Handler[2]	Small Quantity Universal Waste Handler[2]	Conditionally Exempt Small Quantity Universal Waste Generator[2]	Transporter (Transfer Facility)
Generation Rate	Not applicable	Not applicable	<100 kg (220 lb) of hazardous waste and <1 kg (2.2 lb) of acutely hazardous waste generated on-site per calendar month	None
Required Permits, Approvals, & Notifications	EPA identification number	None	None	Must comply with the HMR[4] (49 CFR 171-185) if above the RQ[5]
Labeling & Marking	Mark as universal waste and date received and/or generated	Mark as universal waste and date received and/or generated	Not required	Verify that existing marking is correct
On-site Accumulation Limit	No quantity limit	< 5,000 kg (11, 000 lb)	<1,000 kg (2,200 lb) of hazardous waste or <1 kg (2.2 lb) of acutely hazardous waste	None
Storage Time Limit	one year—unless documentation indicating that such activity is being held for proper recovery, treatment, or disposal	One year—unless documentation indicating that such activity is being held for proper recovery, treatment, or disposal	None	10 days if transfer facility is located in area that is zoned industrial, and 6 days if transfer facility is not.
Training	Basic training—geared toward employee responsibilities, spill response, and emergency procedures	Inform employees; basic training in spill response and emergency procedures for responsible employees	None	Nothing specific required

1. Universal waste requirements apply only during handling and transport of hazardous waste. Destination facility requirements are the same as those for other hazardous wastes.

2. Includes consolidators and collectors.

3. Specific treatment exceptions include removing mercury switches from products, and cleaning a release. Contact DTSC for additional information.

4. Hazardous Materials Regulations.

5. Reportable Quantity.

NOTE: A similar table that gives complete universal waste management requirements and appropriate federal code citations is provided at: http://www.epa.gov/epaoswer/hazwaste/id/univwast/tecreq.htm

APPENDIX C: SUMMARY OF UNIVERSAL WASTE HANDLING, TRANSPORTING AND RECYCLING REQUIREMENTS[1] (CONTINUED)

Waste Management Requirements	Large Quantity Universal Waste Handler[2]	Small Quantity Universal Waste Handler[2]	Conditionally Exempt Small Quantity Universal Waste Generator[2]	Transporter (Transfer Facility)
Recordkeeping	Keep basic records, such as log, invoice, bill of lading, or other shipping document, for three years	Keep basic records, such as log, invoice, bill of lading, or other shipping document, for three years	Not required	No manifest required; keep records of all wastes received for three years
Transporting	Self-transport or use common carrier—ensure sent to appropriate waste handler or destination facility; must comply with HMR[4] if transporting universal waste above RQ[5]	Self transport or use common carrier – ensure sent to proper waste handler or destination facility – must comply with the HMR[4] if transporting universal waste above RQ[5]	Self transport or use common carrier – ensure sent to proper waste handler or destination facility– must comply with the HMR[4] if transporting universal waste above RQ[5]	Transporter may be common carrier; send to proper waste handler or destination facility – must comply with the HMR[4] if transporting universal waste above RQ[5]
Treatment	Generally not allowed (specific exceptions[3])	Generally not allowed (specific exceptions[3])	Generally not allowed (specific exceptions[3])	Not allowed (except by responding to releases)
Reporting	One-time written notification to U.S. EPA of universal waste management unless you already have a U.S. EPA identification number	Not required	Not required	Not required

1. Universal waste requirements apply only during handling and transport of hazardous waste. Destination facility requirements are the same as those for other hazardous wastes.

2. Includes consolidators and collectors.

3. Specific treatment exceptions include removing mercury switches from products, and cleaning a release. Contact DTSC for additional information.

4. Hazardous Materials Regulations.

5. Reportable Quantity.

NOTE: A similar table that gives complete universal waste management requirements and appropriate federal code citations is provided at: http://www.epa.gov/epaoswer/hazwaste/id/univwast/tecreq.htm

APPENDIX D: SUMMARY OF HAZARDOUS WASTE HANDLING, TRANSPORTING AND RECYCLING REQUIREMENTS

Waste Management Requirements	Large Quantity Generator	Small Quantity Generator	Conditionally Exempt Small Quantity Generator	Consolidator/ Collector	Transporter	Destination Facility
Quantity Handled	≥ 1,000 kg/mo (2,200 lb/mo); 1 kg/mo (2.2 lb/mo) acutely hazardous waste	< 1,000 kg/mo (2,200 lb/mo)	≤ 100 kg/mo (220 lb/mo); 1 kg/mo acutely hazardous waste			No limit
Required Permits, Approvals, & Notifications	EPA identification number	EPA identification number	EPA identification number	EPA identification number; Full or Standardized permit	EPA identification number and DTSC registration	EPA identification number and Full or Standardized permit
Labeling & Marking	Label container/tank with the date accumulation begins, the words "hazardous waste," composition/physical state, hazards, generator's name/address (title 22, Cal. Code Regs., § 66262.34).	Label container/tank with the date accumulation begins, the words "hazardous waste," composition/physical state, hazards, generator's name/address (title 22, Cal. Code Regs., § 66262.34).	Label, mark, & pack as hazardous waste in accordance with U.S. DOT under Title 49 CFR, Part 172	Confirm proper labeling	Confirm proper labeling	Confirm proper labeling
On-site Accumulation Limit	No quantity limit	< 6,000 kg (13, 200 lb)	≤ 1,000 kg (2,200 lb) hazardous waste; 1 kg (2.2 lb) acutely hazardous waste; or 100 kg (220 lb) spill residue from acutely hazardous waste	No limit	No limit	No limit
Storage Time Limit	90 days	180 or 270 days	None until 100 kg (220 lb) of hazardous waste or 1 kg of acutely hazardous waste is generated, then 180 to 270 days	10 days	In transit - 6 days or 10 days if transfer area zoned industrial	90 days prior to treatment

APPENDIX D: SUMMARY OF HAZARDOUS WASTE HANDLING, TRANSPORTING AND RECYCLING REQUIREMENTS (CONTINUED)

Waste Management Requirements	Large Quantity Generator	Small Quantity Generator	Conditionally Exempt Small Quantity Generator	Consolidator/ Collector	Transporter	Destination Facility
Training	Initial and annual formal training; and spill response and emergency procedures; and comply with title 22, Cal. Code Regs., §66265.16	Initial informal training; spill response and emergency procedures; and comply with Title 40 CFR, Part 262.34(d)(5)(iii)	Initial informal training; spill response and emergency procedures	Initial and annual training; spill response and emergency procedures	Initial and annual training; spill response and emergency procedures	Initial and annual training; spill response and emergency procedures

APPENDIX D: SUMMARY OF HAZARDOUS WASTE HANDLING, TRANSPORTING AND RECYCLING REQUIREMENTS (CONTINUED)

Waste Management Requirements	Large Quantity Generator	Small Quantity Generator	Conditionally Exempt Small Quantity Generator	Consolidator/ Collector	Transporter	Destination Facility
Manifest/ Recordkeeping	Manifest required; keep records for three years	Manifest required; keep records for three years	No manifest required if self-transporting ≤19 L (5 gal) or 23 kg (50 lb) to a household hazardous waste collection facility or a TSDF. Otherwise, manifest is required; keep records for three years.	Manifest required	Manifest required. Manifest not required if the transporter is the CESQG[1] that generated the hazardous waste	Manifest required; keep records for three years
EPA ID Number/ Transporting	Provide transporter with EPA identification number and DTSC reg. Must comply with HMR[2] if transporting hazardous waste above RQ[3]	Provide transporter with EPA identification number and DTSC reg. Must comply with HMR[2] if transporting hazardous waste above RQ[3]	Provide transporter with EPA identification number and DTSC registration. Must comply with HMR[2] if transporting hazardous waste above RQ[3]. Self transporting ≤ 19 L (5 gal) or 23 kg (50 lb) to household hazardous waste collection is permissible under Health & Safety Code, section 25218.5(b)(1)(A)	Provide transporter with EPA identification number and DTSC reg.	Must comply with HMR[2] if transporting hazardous waste above RQ[3]	Provide transporter with EPA identification number and DTSC reg.
Treatment	Not allowed without authorization	Not allowed without authorization	Not allowed without authorization	Not allowed	Not allowed	Meeting LDRs[4] - IMERC/RMERC at treatment/storage/disposal or recycling facility
Contingency Plan/Emergency Procedure	Written plan required (Cal. Code Regs., tit. 22, ch. 15, art. 4)	Comply with Title 40 CFR, Part 262.34(d)(5)	Comply with Title 40 CFR, Part 262.34(d)(5)	Not required	Must respond to releases	Required
Reporting	Biennial, exception, and additional report	Exception and additional report	Exception and additional report	Not applicable	Not applicable	Not applicable

1. Conditionally Exempt Small Quantity Generator
2. Hazardous Materials Regulations
3. Reportable Quantity
4. Land Disposal Restrictions

NOTE: A similar table that compares hazardous and universal management requirements and appropriate federal code citations is provided at http://www.epa.gov/epaoswer/hazwaste/id/univwast/table.htm.

APPENDIX E
MERCURY SWITCH WASTE HANDLING AND TRANSPORTING FACILITIES LOCATED IN CALIFORNIA*

AERC-MTI (Advanced Environmental Recycling Co. – Mercury Technologies International) 30677 Huntwood Avenue Hayward, CA 94555 Ph: 800-628-3675 Fax: 510-429-1498 www.aercrecycling.com	Chemical Waste Management 35251 Old Skyline Road Kettlemen City, CA 93239 Ph: 550-386-9711
Clean Harbors Los Angeles, LLC Los Angeles Facility 5756 Alba Street Los Angeles, CA 90058 Ph: 323-277-2500 Fax: 323-277-2523 www.cleanharbors.com	Clean Harbors of San Jose, LLC San Jose Facility 1040 Commercial Street, Suite 109 San Jose, CA 95112 Ph: 408-451-5000 Fax: 408-453-6045 www.cleanharbors.com
Kinsbursky Brothers, Inc. 1314 North Anaheim Boulevard Anaheim, CA 92801 Ph: 714-738-8516 Fax: 714-441-0857 www.kinsbursky.com	Kinsbursky Environmental Management 101 North Glover Avenue, Suite B Chula Vista, CA 91909 Ph: 619-409-9292 www.kinsbursky.com
Lighting Resources, Inc. Ontario Branch 805 East Francis Street Ontario, CA 91741 Ph: 888-923-7252 Fax: 909-923-7510 www.lightingresourcesinc.com	North State Environmental – Southern California 2776 South Lilac Avenue Bloomington, CA 92316 Ph: 909-875-9288 Fax: 909-875-9813 www.north-state.com
North State Environmental 5519 Clairemont Mesa Boulevard San Diego, CA 92117 Ph: 858-273-8669 Fax: 858-273-8678 www.north-state.com	North State Environmental – Northern California 90 South Spruce Avenue, Suite C3 South San Francisco, CA 94080 Ph: 650-588-2838 Fax: 650-588-1950 www.north-state.com

APPENDIX E
MERCURY SWITCH WASTE HANDLING AND TRANSPORTING FACILITIES LOCATED IN CALIFORNIA (CONTINUED)*

Onyx Environmental Services, Inc. 4227 Technology Drive Fremont, CA Ph: 510-651-2964 Fax: 510-656-4926 www.onyxes.com	Onyx Environmental Services, Inc. 1704 West First Street Azusa, CA 91702 Ph: 626-334-5117 Fax: 626-334-4563 www.onyxes.com
Onyx Environmental Services, Inc. 5202 Oceanus Drive Huntington Beach, CA 92649 Ph: 714-379-6000 Fax: 714-379-6010 www.onyxes.com	Onyx Environmental Services, Inc. 1125 Hendey Street Richmond, CA 94801 Ph: 510-233-8001 Fax: 510-235-9427 www.onyxes.com
Recyclights, Inc. 2439 Industrial Parkway West Hayward, CA 94545 Ph: 800-884-8982 Fax: 510-782-8984	Safety-Kleen Systems, Inc. Cluster II, Building 3 5400 Legacy Drive Plano, TX 75024 Ph: 800-669-5740 Fax: 972-265-2000 www.safety-kleen.com
Thomas Gray & Associates, Inc. 1205 West Barkley Avenue Orange, CA 92868 Ph: 714-997-8090 Fax: 714-997-3561 www.tgainc.com	

*Most hazardous waste transporters registered with DTSC will provide waste hauling services to generators and handlers of mercury-containing switches and devices.

Sources: The list was compiled from information obtained from phone interviews and an internet survey of companies included on nationwide lists maintained by the Association of Lighting and Mercury Recyclers (www.almr.org); the National Electric Manufacturers Association (www.nema.org/lamprecycle/); the U.S. EPA's Office of Solid Waste and Emergency Response (www.epa.gov/epaoswer/hazwaste/id/univwast/where.htm); and several state resource agencies. A list of permitted commercial facilities that accept hazardous waste for a fee is also available at the DTSC Web site: www.dtsc.ca.gov/HazardousWaste/index/html.

Disclaimer: *This list includes commercial firms found to offer mercury-containing switch handling services. The Department of Toxic Substances Control does not endorse or recommend any specific vendor. In addition, this list is for informational purposes only and is not meant to be a complete or up-to-date list of companies that provide mercury-handling and recycling services in California. Contact companies directly to obtain information regarding services provided, company-specific packaging and labeling requirements, and costs.*

APPENDIX F
MERCURY SWITCH WASTE DESTINATION FACILITIES THAT SERVE CALIFORNIA*

Advanced Environmental Recycling Co. – Mercury Technologies International (AERC-MTI) 2591 Mitchell Avenue Allentown, PA 18103 Ph: 800-554-2372 Fax: 610-791-7696 www.aercrecycling.com	Bethlehem Apparatus Company, Inc. 890 Front Street, P.O. Box Y Hellerton, PA 18055 Ph: 610-838-7034 Fax: 610-838-6333 www.bethlehemapparatus.com
Lighting Resources, Inc. 498 Park Drive Greenwood, IN 46143 Ph: 317-888-3889 Fax: 317-888-3890 www.lightingresourcesinc.com	Mercury Waste Solutions, Inc. National Processing Center 21211 Durand Avenue Union Grove, WI 53182-9711 Ph: 800-741-3343 Fax: 262-878-2699 www.mercurywastesolutions.com
NSSI Sources and Services, Inc. P.O. Box 34042 Houston, TX 77234 Ph: 713-641-0391 Fax: 713-641-6153 www.nssihouston.com	Onyx Environmental Services, Inc., dba Onyx Special Services, Inc. 5736 West Jefferson Street Phoenix, AZ 85043 Ph: 800-368-9095 www.superiorserv.com

*These facilities operate a mercury retort on site to recover mercury from switches.

Sources: The list was compiled from information obtained from telephone interviews and an internet survey of companies included on nationwide lists maintained by the Association of Lighting and Mercury Recyclers (www.almr.org); the National Electric Manufacturers Association (www.nema.org/lamprecycle/); the U.S. EPA's Office of Solid Waste and Emergency Response (www.epa.gov/epaoswer/hazwaste/id/univwast/where.htm); and several state resource agencies. A list of permitted commercial facilities that accept hazardous waste for a fee is also available at the DTSC Web site: www.dtsc.ca.gov/HazardousWaste/index/html.

Disclaimer: *This list includes commercial firms that were found to offer mercury-containing switch recovery services. The Department of Toxic Substances Control does not endorse or recommend a specific vendor. In addition, this list is for informational purposes only and is not meant to be a complete or up-to-date list of vendors that provide mercury recovery services in California. Contact companies directly to obtain information regarding services provided, company-specific packaging and labeling requirements, and costs.*

APPENDIX G
SAMPLE SHIPPING LOG FOR MERCURY SWITCHES

Shipment Date & BOL # or Inv. #	Number of Switches Shipped	Name of Handler Transporting Switches	Contact Information for Handler	Name of Facility Receiving Switches	Contact Information for Facility Receiving Switches

APPENDIX H

VENDORS FOR MERCURY SPILL KITS

Abatix Environmental Supply 3011 East Broadway, Suite #300 Phoenix, AZ 85040 Phone: (602) 323-1941 ; (800) 889-5186 http://www.abatix.com/	**Lab Safety Supply** P.O. Box 1368 Janesville, WI 53547-1368 Phone: (800) 356-0783 http://www.labsafety.com
Advanced Environmental Solutions 204 First Avenue South, Third Floor Seattle, Washington 98104 Phone: 800-275-3549 or 206-652-2323 http://www.advenvironmental.com/	**Mallinckrodt Baker, Inc.** 222 Red School Lane Phillipsburg, NJ 08865 Phone: (800) 582-2537 http://www.mallbaker.com/
Bel-Art Products 6 Industrial Rd. Pequannock, NJ 07440-1992 Phone: (973) 694-0500 http://www.bel-art.com/	**Thomas Scientific** 99 High Hill Rd. @ I-295 P.O. Box 99 Swedesboro, NJ 08085 Phone: (800) 345-2100 http://www.thomassci.com
Bethlehem Apparatus Co. Inc. Resource Recovery and Recycling Division 890 Front St., P.O. Box Y Hellertown, PA 18055 Phone: (610) 838-7034 http://www.mercuryrecycling.com	**VWR Scientific Products** 5 Marway Circle Rochester, NY 14624 Phone: (800) 932-5000 or (716) 247-0613 http://www.vwrsp.com
Fisher Scientific 2000 Park Lane Pittsburgh, PA 15275 Phone: (800) 772-6733 https://www1.fishersci.com	**Lamp Recyclers of Louisiana, Inc.** 46257 Morris Road Hammond, LA 70404-2962 Phone: (985) 345-4147 http://www.i-55.com/lamprecycler/
Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 Phone: (800) 452-1261 http://www.flinnsci.com	**Sanderson Safety Supply** 1101 SE 3rd Ave. Portland, Oregon 97214 Phone: (800) 547-0927 http://www.sandersonsafety.com/

Source:

Disclaimer: *This list includes commercial firms known to sell mercury spill kits. The Department of Toxic Substances Control does not endorse or recommend a specific vendor. In addition, this list is for informational purposes only and is not meant to be a complete or up-to-date list of companies that provide spill kits. Contact companies directly to obtain further information.*